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EXAMINER	
PETTITT, JOHN F	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentmail@whda.com

Office Action Summary	Application No.	Applicant(s)
	10/594,278	WATANABE ET AL.
	Examiner	Art Unit
	JOHN PETTITT	3744

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 October 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-13 and 15* is/are pending in the application.

5a) Of the above claim(s) *8-10* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-7, 11-13, 15* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7, 11-13, 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In regard to claim 1, the recitation, "the first tube portion located higher than the second tube portion" is not supported by the application, the vertical tubes are the same length and are not located one above the other, therefore the recitation is new matter.

In regard to claim 15, the application does not have support for an apparatus having both a first gas injection means located at the top of the torus and a second gas injection means located at the bottom of the torus as claimed. Rather the applicant only has support for one gas injection means - one at the top of the torus or one at the bottom (spec. parag. 52).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-7, 11-13, 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regard to claim 1, the recitation, “the first tube portion located higher than the second tube portion” is indefinite as it is unclear how the tube portions recited are or can be higher or lower than one another, especially in view of the fact that the applicant's invention is disclosed as having equal vertical tube portions.

Additionally, as the applicant has indicated that the gas injection means must be interpreted under 112 sixth paragraph, to correspond to the structure disclosed in the specification, it is noted that there is no further structure taught by the specification other than a means that injects gas and therefore, the claims are indefinite when interpreted in this way.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-4, 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the obvious modification of Swift (US 6032464).

In regard to claim 1, Swift (464) teaches a thermoacoustic apparatus (Fig. 13C) comprising: a loop tube (222, 210) inside which is a working fluid (helium or argon; column 9, line 13, 53); a first stack (234) sandwiched between a first high-temperature-side heat exchanger (232; note that the heat exchangers are provided as examples and that operation at different temperatures is certainly possible) and a first low-temperature-side heat exchanger (236), the first stack (234) being provided in the loop tube (222, 210); and a second stack (216) sandwiched between a second high-temperature-side heat exchanger (218) and a second low-temperature-side heat exchanger (214), the second stack (216) being provided in the loop tube (222, 210), wherein a standing wave and a traveling wave are generated through self excitation by heating the first high-temperature-side heat exchanger (232), so that the second low-temperature-side heat exchanger (214) is cooled by the standing wave and the traveling wave (depending on the use of the system; column 15, line 48), or wherein a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger (236), so that the second high-temperature-side heat exchanger (218) is heated by the standing wave and the traveling wave, a support (inherent to locating the device in any location) disposed such that the loop tube is configured to include first and second linear tube portions (222, 210), which are vertical and first and second connection tube portions (top and bottom ones) shorter than the

first and second linear tube portions (222, 210), and wherein the first stack (234) is disposed in the first linear tube portion (210), wherein the second stack (216) is disposed in the second linear tube portion (left one of 222) than the first stack (234) is disposed, wherein the second stack (216) is disposed at a level higher that the first stack (234). It is again noted that the working fluid is identified as argon (column 9, line 13) and also teaches helium (column 9, line 53).

Swift (464) does not explicitly teach that the torus (Fig. 13C) has an argon injection apparatus disposed at the center of the top tube in the torus (Fig. 13C) or a helium injection apparatus disposed at the center of the bottom tube in the torus (Fig. 13C; interpreted to be a structure that is capable of moving working fluid into the torus). Swift suggests providing an acoustical power apparatus (76, 40) that injects gas (cyclically via pressure waves) in the other figures (Figures 3, 4, 13A, 13D; column 6, line 50) to either the top or bottom side of the device. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Swift (Fig. 13C) with a gas injection apparatus (76, 40) at the top or bottom of the torus for the purpose of adding acoustical power to the device and for the purpose of doing so while allowing the sides to remain available and free for heat transfer. It is noted that the structure described above is fully capable of injecting working fluid so that the fluid rises or falls through the first and second tube portions as inherent to argon and helium.

In regard to claim 2, see figure 13C and the column 11, line 35; column 12, line 25.

In regard to claims 3-4, it is noted that the apparatus is fully capable of operating with cooling or heating either the first or second stacks (234, 216) as an operator desires.

In regard to claim 6, note that inherent to the creation of the high and low temperatures in the thermoacoustic cycle is that the pressure of the fluid peaks in the vicinity of first and second stacks (column 5, lines 10-15, 35-37, column 4, line 40).

In regard to claim 7, Swift teaches an acoustic wave generator (40, 76) is disposed on an outer perimeter of the loop (222, 210).

Claims 1-4, 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the obvious modification of Swift (US 6032464) using an alternative interpretation of the gas injection apparatus as an external source. It is noted that the remaining rejections employ this interpretation.

In regard to claim 1, Swift (464) teaches a thermoacoustic apparatus (Fig. 13C) comprising: a loop tube (222, 210); a first stack (234) sandwiched between a first high-temperature-side heat exchanger (232; note that the heat exchangers are provided as examples and that operation at different temperatures is certainly possible) and a first low-temperature-side heat exchanger (236), the first stack (234) being provided in the loop tube (222, 210); and a second stack (216) sandwiched between a second high-temperature-side heat exchanger (218) and a second low-temperature-side heat exchanger (214), the second stack (216) being provided in the loop tube (222, 210), wherein a standing wave and a traveling wave are generated through self excitation by

heating the first high-temperature-side heat exchanger (232), so that the second low-temperature-side heat exchanger (214) is cooled by the standing wave and the traveling wave (depending on the use of the system; column 15, line 48), or wherein a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger (236), so that the second high-temperature-side heat exchanger (218) is heated by the standing wave and the traveling wave, a support (inherent to locating the device in any location) disposed such that the loop tube is configured to include first and second linear tube portions (222, 210), which are vertical and first and second connection tube portions (top and bottom ones) shorter than the first and second linear tube portions (222, 210), and wherein the first stack (234) is disposed in the first linear tube portion (210), wherein the second stack (216) is disposed in the second linear tube portion (left one of 222) than the first stack (234) is disposed, wherein the second stack (216) is disposed at a level higher that the first stack (234). It is noted that the working fluid is identified as argon (column 9, line 13) and also teaches helium (column 9, line 53).

Swift (464) does not explicitly teach that the torus (Fig. 13C) has an argon injection apparatus disposed at the center of the top tube in the torus (Fig. 13C) or a helium injection apparatus disposed at the center of the bottom tube in the torus (Fig. 13C) for introducing the working fluid into the torus from an exterior source. However, providing a means for introducing the working fluid is an inherent part of operating the device of Swift (464) that cannot be omitted and is essential to operating the device. Also, Swift suggests providing an acoustical power apparatus (76, 40) that injects gas

(cyclically via pressure waves) in the other figures (Figures 3, 4, 13A, 13D; column 6, line 50) to either the top or bottom side of the device. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Swift with a gas injection apparatus at either the top or the bottom for the purpose of installing argon or helium and for the purpose of doing so while allowing the sides to remain available and free for heat transfer and for the purpose of conveniently permitting the injection of the working fluids to adjust the operating properties of the refrigerator as desired for different conditions. It is noted that the structure described is fully capable of injecting working fluid so that the fluid rises or falls through the first and second tube portions as inherent to argon and helium.

In regard to claim 2, see figure 13C and the column 11, line 35; column 12, line 25.

In regard to claims 3-4, it is noted that the apparatus is fully capable of operating with cooling or heating either the first or second stacks (234, 216) as an operator desires.

In regard to claim 6, note that inherent to the creation of the high and low temperatures in the thermoacoustic cycle is that the pressure of the fluid peaks in the vicinity of first and second stacks (column 5, lines 10-15, 35-37, column 4, line 40).

In regard to claim 7, Swift teaches an acoustic wave generator (40, 76) is disposed on an outer perimeter of the loop (222, 210).

Claims 1-4, 6-7, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swift (US 6032464) in view of Wighard (US 5813234).

In regard to claims 1, 15, Swift (464) teaches a thermoacoustic apparatus (Fig. 13C) comprising: a loop tube (222, 210); a first stack (234) sandwiched between a first high-temperature-side heat exchanger (232; note that the heat exchangers are provided as examples and that operation at different temperatures is certainly possible) and a first low-temperature-side heat exchanger (236), the first stack (234) being provided in the loop tube (222, 210); and a second stack (216) sandwiched between a second high-temperature-side heat exchanger (218) and a second low-temperature-side heat exchanger (214), the second stack (216) being provided in the loop tube (222, 210), wherein a standing wave and a traveling wave are generated through self excitation by heating the first high-temperature-side heat exchanger (232), so that the second low-temperature-side heat exchanger (214) is cooled by the standing wave and the traveling wave (depending on the use of the system; column 15, line 48), or wherein a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger (236), so that the second high-temperature-side heat exchanger (218) is heated by the standing wave and the traveling wave, a support (inherent to locating the device in any location) disposed such that the loop tube is configured to include first and second linear tube portions (222, 210), which are vertical and first and second connection tube portions (top and bottom ones) shorter than the first and second linear tube portions (222, 210), and wherein the first stack (234) is disposed in the first linear tube portion (210), wherein the second stack (216) is

disposed in the second linear tube portion (left one of 222) than the first stack (234) is disposed, wherein the second stack (216) is disposed at a level higher that the first stack (234). It is noted that the working fluid is identified as argon (column 9, line 13) and also teaches helium (column 9, line 53).

Swift (464) does not explicitly teach that the torus (Fig. 13C) has an argon injection apparatus disposed at the center of the top tube in the torus (Fig. 13C) or a helium injection apparatus disposed at the center of the bottom tube in the torus (Fig. 13C) for introducing the working fluid into the torus from an exterior source. However, providing a means for introducing the working fluid is an inherent part of operating the device of Swift (464) that cannot be omitted and is essential to operating the device. In addition, Wighard (US 5813234) teaches that it is well known to fill thermoacoustic devices with Helium and Argon and to adjust working fluid properties by controlling the amounts of helium and argon put into the device (column 1, line 37, column 8, line 3, 10-11). Also, Swift suggests providing an acoustical power apparatus (76, 40) that injects gas (cyclically via pressure waves) in the other figures (Figures 3, 4, 13A, 13D; column 6, line 50) to either the top or bottom side of the device. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Swift with a gas injection apparatus at either the top or the bottom for the purpose of installing the argon or helium and for the purpose of doing so while allowing the sides to remain available and free for heat transfer and for the purpose of conveniently permitting the injection of the working fluids to adjust the operating properties of the refrigerator as desired for different conditions. It is noted that the

structure described is fully capable of injecting working fluid so that the fluid rises or falls through the first and second tube portions as inherent to argon and helium. In regard to claim 15, while the applicant does not have support for both argon and helium injection means, it is noted that providing both injection means is considered an obvious means of providing the mixtures described by Wighard.

In regard to claim 2, see figure 13C and the column 11, line 35; column 12, line 25.

In regard to claims 3-4, it is noted that the apparatus is fully capable of operating with cooling or heating either the first or second stacks (234, 216) as an operator desires.

In regard to claim 6, note that inherent to the creation of the high and low temperatures in the thermoacoustic cycle is that the pressure of the fluid peaks in the vicinity of first and second stacks (column 5, lines 10-15, 35-37, column 4, line 40).

In regard to claim 7, Swift teaches an acoustic wave generator (40, 76) is disposed on an outer perimeter of the loop (222, 210).

Claims 1-4, 6-7, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swift (US 6032464) in view of Garrett (US 5953921).

In regard to claims 1, 15, Swift (464) teaches a thermoacoustic apparatus (Fig. 13C) comprising: a loop tube (222, 210); a first stack (234) sandwiched between a first high-temperature-side heat exchanger (232; note that the heat exchangers are provided as examples and that operation at different temperatures is certainly possible) and a

first low-temperature-side heat exchanger (236), the first stack (234) being provided in the loop tube (222, 210); and a second stack (216) sandwiched between a second high-temperature-side heat exchanger (218) and a second low-temperature-side heat exchanger (214), the second stack (216) being provided in the loop tube (222, 210), wherein a standing wave and a traveling wave are generated through self excitation by heating the first high-temperature-side heat exchanger (232), so that the second low-temperature-side heat exchanger (214) is cooled by the standing wave and the traveling wave (depending on the use of the system; column 15, line 48), or wherein a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger (236), so that the second high-temperature-side heat exchanger (218) is heated by the standing wave and the traveling wave, a support (inherent to locating the device in any location) disposed such that the loop tube is configured to include first and second linear tube portions (222, 210), which are vertical and first and second connection tube portions (top and bottom ones) shorter than the first and second linear tube portions (222, 210), and wherein the first stack (234) is disposed in the first linear tube portion (210), wherein the second stack (216) is disposed in the second linear tube portion (left one of 222) than the first stack (234) is disposed, wherein the second stack (216) is disposed at a level higher that the first stack (234). It is noted that the working fluid is identified as argon (column 9, line 13) and also teaches helium (column 9, line 53).

Swift (464) does not explicitly teach that the torus (Fig. 13C) has an argon injection apparatus disposed at the center of the top tube in the torus (Fig. 13C) or a

helium injection apparatus disposed at the center of the bottom tube in the torus (Fig. 13C) for introducing the working fluid into the torus from an exterior source. However, providing a means for introducing the working fluid is an inherent part of operating the device of Swift (464) that cannot be omitted and is essential to operating the device. In addition, Garrett (921) teaches that it is well known to fill thermoacoustic devices with Helium and Argon and to adjust working fluid properties by controlling the amounts of helium and argon put into the device (column 4, lines 20-25; column 8, line 1). Also, Swift suggests providing an acoustical power apparatus (76, 40) that injects gas (cyclically via pressure waves) in the other figures (Figures 3, 4, 13A, 13D; column 6, line 50) to either the top or bottom side of the device. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Swift with a gas injection apparatus at either the top or the bottom for the purpose of installing the argon or helium and for the purpose of doing so while allowing the sides to remain available and free for heat transfer and for the purpose of conveniently permitting the injection of the working fluids to adjust the operating properties of the refrigerator as desired for different conditions. It is noted that the structure described is fully capable of injecting working fluid so that the fluid rises or falls through the first and second tube portions as inherent to argon and helium. In regard to claim 15, while the applicant does not have support for both argon and helium injection means, it is noted that providing both injection means is considered an obvious means of providing the mixtures described by Garrett (921).

In regard to claim 2, see figure 13C and the column 11, line 35; column 12, line 25.

In regard to claims 3-4, it is noted that the apparatus is fully capable of operating with cooling or heating either the first or second stacks (234, 216) as an operator desires.

In regard to claim 6, note that inherent to the creation of the high and low temperatures in the thermoacoustic cycle is that the pressure of the fluid peaks in the vicinity of first and second stacks (column 5, lines 10-15, 35-37, column 4, line 40).

In regard to claim 7, Swift teaches an acoustic wave generator (40, 76) is disposed on an outer perimeter of the loop (222, 210).

Claims 1-4, 6-7, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swift (US 6032464) in view of Garrett (US 5647216).

In regard to claims 1 and 15, Swift (464) teaches a thermoacoustic apparatus (Fig. 13C) comprising: a loop tube (222, 210); a first stack (234) sandwiched between a first high-temperature-side heat exchanger (232; note that the heat exchangers are provided as examples and that operation at different temperatures is certainly possible) and a first low-temperature-side heat exchanger (236), the first stack (234) being provided in the loop tube (222, 210); and a second stack (216) sandwiched between a second high-temperature-side heat exchanger (218) and a second low-temperature-side heat exchanger (214), the second stack (216) being provided in the loop tube (222, 210), wherein a standing wave and a traveling wave are generated through self

excitation by heating the first high-temperature-side heat exchanger (232), so that the second low-temperature-side heat exchanger (214) is cooled by the standing wave and the traveling wave (depending on the use of the system; column 15, line 48), or wherein a standing wave and a traveling wave are generated through self excitation by cooling the first low- temperature-side heat exchanger (236), so that the second high-temperature-side heat exchanger (218) is heated by the standing wave and the traveling wave, a support (inherent to locating the device in any location) disposed such that the loop tube is configured to include first and second linear tube portions (222, 210), which are vertical and first and second connection tube portions (top and bottom ones) shorter than the first and second linear tube portions (222, 210), and wherein the first stack (234) is disposed in the first linear tube portion (210), wherein the second stack (216) is disposed in the second linear tube portion (left one of 222) than the first stack (234) is disposed, wherein the second stack (216) is disposed at a level higher that the first stack (234). It is noted that the working fluid is identified as argon (column 9, line 13) and also teaches helium (column 9, line 53).

Swift (464) does not explicitly teach that the torus (Fig. 13C) has an argon injection apparatus disposed at the center of the top tube in the torus (Fig. 13C) or a helium injection apparatus disposed at the center of the bottom tube in the torus (Fig. 13C) for introducing the working fluid into the torus from an exterior source. However, providing a means for introducing the working fluid is an inherent part of operating the device of Swift (464) that cannot be omitted and is essential to operating the device. In addition, Garrett (216) teaches that it is well known to fill thermoacoustic devices with

Helium and Argon and to adjust working fluid properties by controlling the amounts of helium and argon put into the device (column 8, line 1). Also, Swift (464) suggests providing an acoustical power apparatus (76, 40) that injects gas (cyclically via pressure waves) in the other figures (Figures 3, 4, 13A, 13D; column 6, line 50) to either the top or bottom side of the device. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Swift with a gas injection apparatus at either the top or the bottom for the purpose of installing the helium or argon and for the purpose of doing so while allowing the sides to remain available and free for heat transfer and for the purpose of conveniently permitting the injection of the working fluids to adjust the operating properties of the refrigerator as desired for different conditions. It is noted that the structure described is fully capable of injecting working fluid so that the fluid rises or falls through the first and second tube portions as inherent to argon and helium. In regard to claim 15, while the applicant does not have support for both argon and helium injection means, it is noted that providing both injection means is considered an obvious means of providing the mixtures described by Garrett (216).

In regard to claim 2, see figure 13C and the column 11, line 35; column 12, line 25.

In regard to claims 3-4, it is noted that the apparatus is fully capable of operating with cooling or heating either the first or second stacks (234, 216) as an operator desires.

In regard to claim 6, note that inherent to the creation of the high and low temperatures in the thermoacoustic cycle is that the pressure of the fluid peaks in the vicinity of first and second stacks (column 5, lines 10-15, 35-37, column 4, line 40).

In regard to claim 7, Swift teaches an acoustic wave generator (40, 76) is disposed on an outer perimeter of the loop (222, 210).

Claims 5-6, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of the rejections above and further in view of Swift (US 6164073).

In regard to claim 5, Swift (464) does not appear to teach the location of the center of the stack (216) in relation to the ends of the vertical tube portions (222, 210), however, it is noted that the stack's location in Swift (464) appears to be located near the same location as in the applicant's figure. Further, it is seen that the locating of the stack in the loop is nearly inherent in order for the device to operate properly (column 5, lines 60-65 - shows that the length of the torous is explicitly considered). Lastly considering that the stack's location is shown in the Swift (464) it is considered a matter of routine experimentation to determine the optimal location relative to the length of the loop. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to locate the stack at about ¼ the length of the tube portions for the purpose of providing the optimal thermoacoustic torus loop. Furthermore, the same reasoning applies to claim 6 in addition to the evidence that the pressures must peak near the stacks.

In regard to claim 11, Swift (464) teaches most of the claim limitations, but does not explicitly teach a stack structure that provides flow path lengths of individual connection channels are decreased one after another from the medial to the lateral ends of the stack. However, Swift (073) teaches that the stack (32, 34) is formed from plates (column 5, line 6) in a circular cross section tube for a thermoacoustic cooler, and therefore there is a flow length (when viewing the cross-section) that is decreased when moving from the medial to the lateral ends. Swift (073) further teaches that such stack structure was previously invented (column 5, lines 1-5). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the stack structure of Swift (073) in the cooler of Swift (464) for the purpose of improving the efficiency of the cooler and employing a stack structure that has been shown to be effective.

In regard to claim 13, Swift (464) teaches most of the claim limitations, but does not appear to teach staging the low temperature heat exchangers of at least two thermoacoustic coolers. However, Swift (073) teaches such staging is old in the art of thermoacoustic coolers (column 7, lines 50-55), additionally and/or alternatively cascade refrigeration is a well known and old method of producing lower refrigeration temperatures. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide cooling from one low temperature heat exchanger to another thermoacoustic cooler for the purpose of providing cooling at lower temperatures.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over any of the rejections above and further in view of either Smith (US 2003/0192324) or Belaire (US 4057962). Swift (464) as modified teaches most of the claim limitations including, that the product of the anugular frequency and temperature relaxation time is in the range of 0.2 to 20 (since omega*tau = (2*PI*frequency)*(r^2 / 2*alpha and Swift (464) shows that the flow path radius is about 12 micrometers - column 9, line 35, and 42 micrometers - column 11, line 39 and the fluid is argon defining the diffusion coefficient, therefore the value is a function only of frequency which is user set and therefore the device of Swift (464) is fully capable of such range), but does not appear to teach sintered metal for the regenerator, however, Smith (324) (parag. 99) teaches that regenerators are known to be sintered, and alternatively, Belaire (column 3, lines 54-61) teaches that regenerators are known to be sintered. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to sinter the screens of Swift (464) for the purpose making the handling and installation of the regenerator easier and for the purpose of making ensuring the orientation of the regenerator material for uniformity of flow.

Response to Arguments

Applicant's arguments filed 10/27/2011 have been fully considered but they are not persuasive.

1. Applicant’s arguments (pages 9-13) are a general allegation that the prior art does not teach the amended limitations. In response, the applicant is directed above wherein it is shown that the prior art teaches the claimed invention. Relative to the

applicant's assertion that the gas injection means of the claims should be interpreted under 112 sixth paragraph to correspond to the structure of the gas injection means taught by the specification, it is noted that there is no description of the gas injection means anywhere in the application other than that it is a means of injecting gas. It is considered that the specification's teachings do support the inclusion of a gas injection means. However, as the applicant's arguments do not state what structure the prior art fails to teach and the specification fails to teach any structure more specifically than a means that can inject gas, therefore the claims are considered indefinite and , the allegation is considered unpersuasive.

2. Applicant's arguments (page 11, ¶ 3) are that the examiner has stated that the prior art does not inject the working fluid. In response, it is noted that this is not correct. Swift teaches that the torus has working fluid injected but doesn't teach injecting the working fluid at the locations claimed. In response to the allegation that Swift is unpredictable to modify, it is noted that this allegation is unsubstantiated and unpersuasive.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John F. Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John F Pettitt /
Examiner, Art Unit 3744

/CHERYL J. TYLER/
Supervisory Patent Examiner, Art Unit 3744

JFP III
December 30, 2011